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Trophic flow within the microbial and mesozooplankton food web in the North Atlantic: processes indicated by analyses of stable isotopes and biovolume spectra

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The trophic flow from primary producers through the microbial and mesozooplankton food web makes sun energy available in particulate form for higher trophic levels. Pathways through the lower trophic levels are highly variable and determine productivity of the marine pelagic food webs. We analysed spatial variability in food web structure across the North Atlantic by means of stable isotope analyses (SIA) and biovolume spectrum theories (BST). At 7 stations in the Iceland Basin, Reykjanes Ridge, Irminger Basin and Labrador Sea, respectively, chlorophyll a, zooplankton net samples (55 µm and 150 µm) and laser optical plankton counter data were collected in the upper 200 to 500 m during a EURO-BASIN cruise with R/V M.S.Merian in spring (March/April) 2013. Trophic indices were determined by both methods (SIA and BST) for different size groups of the pelagic community. For the smallest fraction, both methods yielded trophic indices around 2 to 3 and agreed reasonable well. Large differences between both methods were observed in the medium-sized fraction, which was dominated by more omnivorous species, with much higher trophic indices estimated by BST. The largest fraction showed slightly higher value by BST, especially in the Labrador Sea. Comparing differences between SIA and BST might allow to trace energy flow through the microbial food web. A conceptual model is developed for the trophic flow through the lower trophic levels and discussed with respect to phytoplankton bloom stage, water mass, and stratification.